means of faculæ—appears to be of the period of two solar rotations.

Besides this conclusion, which was the chief object for which the above table was prepared, the following points for more detailed investigation and study are suggested by the summary review of the disturbances during the last nineteen years :—

(1) In the alternations of quiet and disturbed periods, seven of twenty-two are of equal duration reckoned in rotations of the Sun. Is this equality of alternating periods merely a coincidence ?

(2) The action of the foci of disturbance differs in the maximum and in the minimum periods of sun-spots. In the former it is at some time continuous, in the latter always intermittent.

(3) In a set of allied disturbances the mode of action of the force causing them is at first intermittent, then culminates in a grand outburst, and dies away in another set of intermittent disturbances.

(4) The superposition of minor subsidiary cycles of disturbance upon the main cycle of eleven years seems to be apparent.

(5) Groups towards the end of the period of maximum seem to grow and decline very rapidly.

(6) There seems to be no doubt that allied disturbances occur in identical positions north and south of the equator of similar character and extent.

(7) The noteworthy concentration of disturbances in the southern hemisphere of the Sun during the last maximum and the preceding minimum suggests an answering concentration of disturbances in the northern hemisphere in the coming maximum.

Stonyhurst College Observatory:
1900 *May* 5.

Note on Measures by Professor Barnard of two Standard Points on the Moon's Surface. By S. A. Saunder, M.A.

In a paper communicated to the Society last January (*ante*, p. 174) attention was called to the increase of accuracy in selenographic positions which might be attained by measuring from a well-determined point instead of from the limb, and to the suitability of Mösting A as an origin. It was my good fortune that Professor Barnard was present at the meeting at which the paper was read, and the next day he most kindly offered to measure a few points on the Moon itself if the results would be of any assistance to me. This generous offer I gladly accepted, and I have now received from him the particulars of measures made on April 7 and 9, with the full aperture of the 40-inch telescope of the Yerkes Observatory, and a magnifying power of

700 diameters. The measures made were of the distances and position-angles of the lines joining the centres of Mösting A, Ptolemaus A, and Triesnecker B. Each position-angle was measured four or five times on each night, and each distance eight or nine times. These measures I have reduced by the methods described in the paper referred to with the following results.

Assuming Professor Franz's position for Mösting A and denoting the coordinates of the other points by the suffixes p, t respectively, Professor Barnard's measures give :—

1900 Apr. 7	$\xi_p = -{\cdot}0142$	$\eta_p = -{\cdot}1478$
	$\xi_t = +{\cdot}0071$	$\eta_t = +{\cdot}0202$
	$\xi_t - \xi_p = +{\cdot}0212$	$\eta_t - \eta_p = +{\cdot}1686$
Apr. 9	$\xi_p = -{\cdot}0141$	$\eta_p = -{\cdot}1477$
	$\xi_t = +{\cdot}0072$	$\eta_t = +{\cdot}0207$
	$\xi_t - \xi_p = +{\cdot}0217$	$\eta_t - \eta_p = +{\cdot}1684$

the absolute values of the coordinates being obtained from the measures connecting the points with Mösting A, those of the differences from measures connecting the points directly. The final values obtained from these are :—

$$\xi_p = -{\cdot}0142 \pm {\cdot}00007 \qquad \eta_p = -{\cdot}1479 \pm {\cdot}00007$$
$$\xi_t = +{\cdot}0072 \pm {\cdot}00007 \qquad \eta_t = +{\cdot}0205 \pm {\cdot}00007$$

Professor Barnard writes : "The measures were made with the utmost care that could be exercised under the conditions," but "the objects are so large, especially with a big telescope, that considerable discordances might be expected in the measures from difference of illumination, position, &c."

"On April 7 the three craters were approximately measured. The seeing was very poor (on the 9th also), and the crater form was not well enough seen to make exact measures, but these will not be far out. They will give some idea of the size of the spot one has to bisect in making the measures.

Apparent diameter of		Mösting A	6″·38
,,	,,	Ptolemaus A	4·66
,,	,,	Triesnecker B	2·94"

The position-angles of the measured diameters were such that these distances require to be multiplied by 1·0270, 1·0262, 1·0058 respectively in order to obtain the corresponding maximum diameters. The Moon's occultation radius at the time was 908″·0, and hence, remembering that the formations were nearer

than the radius which subtends this angle, the real diameters are found to be :—

Mösting A	·00718	of Moon's radius	= 7·77	miles
Ptolemaus A	·00524	,, ,,	= 5·67	,,
Triesnecker B	·00325	,, ,,	= 3·51	,,

One of my reasons for asking for measures of these particular points was that, their positions being known, I should be able to find the centre of the disc on any given photograph on which they appear without encountering the difficulties involved in measuring from the limb. A second reason was that a comparison of my own results with Professor Barnard's would show whether my measures are affected by any serious systematic error.

In my previous paper (*ante*, p. 181) I give the results of five nights' measures of Ptolemaus A, of which the means are :—

$$\xi_p = -\cdot 0139 \qquad \eta_p = -\cdot 1477$$

I have also taken the following :—

1900 Feb.	8	$\xi_p = -\cdot 0139$	$\eta_p = -\cdot 1472$
1899 Nov.	18	$\xi_t = +\cdot 0068$	$\eta_t = +\cdot 0205$
Dec.	13	$+\cdot 0076$	$+\cdot 0203$
	15	$+\cdot 0079$	$+\cdot 0206$
1900 Feb.	8	$+\cdot 0073$	$+\cdot 0204$
	8	$\xi_t - \xi_p = +\cdot 0210$	$\eta_t - \eta_p = +\cdot 1687$
	9	$+\cdot 0213$	$+\cdot 1685$

The final result from all my measures being

$$\xi_p = -\cdot 0139 \pm \cdot 00008 \qquad \eta_p = -\cdot 1478 \pm \cdot 00008$$
$$\xi_t = +\cdot 0073 \pm \cdot 00009 \qquad \eta_t = +\cdot 0206 \pm \cdot 00010$$

My individual measures are, as was to be expected, more discordant than those of Professor Barnard, but on comparing my final values with his it appears that in only one case is there a difference of more than ·0001, *i.e.* of more than 0″·1, and this coordinate, for which the difference is 0″·3, is the one in which the two causes noticed by Professor Barnard, viz. size of objects measured and changes of illumination, combine to produce their greatest effect.

In order to test the existence of systematic error more closely, I have, from these places, computed the values of the lines and angles actually measured as they would appear under mean libration. The following are the results from Professor Barnard's measures :—

Lengths of Lines.

MP ·1194 , MT ·1234 , PT ·1698

Inclinations to Axis of ξ.

MP 129°·39 , MT 38°·06 , PT 82°·76

From my measures:—

Lengths of Lines.

MP ·1195 , MT ·1236 , PT ·1697

Inclinations to Axis of ξ.

MP 129°·54 , MT 38°·07 , PT 82°·82

This comparison seems to justify the conclusion that my measures are subject to no serious systematic error, and to support my claim that the positions given in my previous paper are of a higher order of accuracy than those found by measuring from the limb.

These two points, Ptolemaus A and Triesnecker B, are now—next to Mösting A—the best known positions on the Moon's surface.

Professor Barnard says in the letter which accompanies his measures that he had intended to give three nights to the work, but that he found it too trying to his eyesight. The fact that under these conditions he did not stop after the first night renders the extent of my obligation to him a very great one; and I am sure that all will concur in the earnest hope that what he has so kindly done may not have impaired that well-known sensitiveness of retina of which his discoveries have given so many proofs.

On Planning Photographic Observations of Eros. Arthur R. Hinks, M.A.

1. In considering a scheme of photographic operations for the coming opposition of *Eros* the following points suggest themselves:—The planet is so faint, and its motion is so rapid, that it will be necessary with all instruments, except perhaps the largest, to follow on the planet and let the stars trail. In September and October, and again in January, the necessary exposures will run into minutes, especially since, according to Professor Pickering, the planet is photographically about $0^{m}\cdot6$ fainter than the visual magnitude.